



## Abstracts 14th Working Conference of the Pharmaceutical Care Network Europe (PCNE) “Strengthening pharmaceutical care research and practice” 5 -8 February 2025. Innsbruck, Austria

Submitted by:

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### Mismatch Between Medication Intake and Refill: Validation of the Traditional Chinese Version of the Adherence to Refills and Medications Scale among Adults with Type 2 Diabetes

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**Background:** The Adherence to Refills and Medications Scale (ARMS) is a commonly used tool for assessing medication adherence. Besides evaluating adherence to taking medications, the ARMS identifies potential challenges in filling or refilling prescriptions. Despite its widespread use, the ARMS has yet to be validated for patients who read Traditional Chinese.

**Purpose:** This study translated and validated the Traditional Chinese version of the ARMS (ChARMS-T) and explored common barriers to medication adherence among individuals with type 2 diabetes (T2D) in Taiwan.

**Method:** The ChARMS-T was developed in translation and application phases. In the translation phase, the scale underwent forward and backward translation, followed by cognitive debriefing. In the application phase, the finalized ChARMS-T was administered to participants at five community pharmacies in Taiwan over a nine-month period beginning in September 2023. Eligible participants were adults of 18 years or older, diagnosed with T2D, prescribed at least one oral diabetes medication, and able to read Traditional Chinese. The psychometric evaluation included assessing criterion validity, construct validity via confirmatory factor analysis, and reliability using McDonald's  $\omega$ .

**Findings:** Three hundred and forty-three patients participated in the study. Confirmatory factor analysis revealed a two-factor structure for the 12-item ChARMS-T, which includes the domains of medication-taking (8 items) and medication refill (4 items). The internal consistency reliability of the instrument was found to be acceptable, with McDonald's  $\omega$  scores of 0.841 for medication-taking and 0.647 for medication refill. The medication refill subscale demonstrated strong agreement with the objective refill measure, the proportion of days covered, yielding a coefficient of 0.86. Evidence of known-groups validity was established by a significant difference between ChARMS-T scores and glycemic control ( $p = 0.047$ ). Patients with good glycemic control exhibited a significantly higher adherence rate for both medication refills and medication-taking than those with poor glycemic control. The most frequently reported barriers to medication-taking included carelessness (55.7%,  $n = 191$ ), forgetfulness (54.8%,  $n = 188$ ), and frequent dosing intervals (43.1%,  $n = 148$ ). Regarding medication refills, 33 participants (9.6%) cited a lack of planning as the primary reason for

not refilling their diabetes medications on time, followed by forgetfulness (7.6%,  $n = 26$ ).

**Conclusion:** The ChARMS-T uncovered a wider variety of reasons for non-adherence and showed satisfactory psychometric properties. It can be incorporated into clinical practice for screening and follow-up. This approach promotes effective communication between healthcare professionals and patients, thereby enhancing medication adherence and improving long-term patient health outcomes.

<https://doi.org/10.1016/j.sapharm.2025.02.012>

### Evaluating Large language models in Identifying and Addressing Drug-Related Problems: Clinical Pharmacists' Perspectives on ChatGPT's Accuracy

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**Background:** Artificial intelligence (AI) incorporates aspects of human intelligence, including reasoning, problem-solving, planning, learning, responsiveness, comprehension, and language generation, and includes fields like natural language processing (NLP). Large Language Models (LLMs), a subset of NLP, are specifically designed to understand and produce human language. Given these capabilities, LLMs hold potential for use in pharmaceutical cognitive services, such as medication reviews.

**Purpose:** The purpose of this study was to evaluate the effectiveness of LLM in identifying and addressing drug-related problems. The study focused on clinical pharmacists' perspectives regarding the accuracy, clarity, comprehensiveness, linguistic precision, and reasoning of LLM-generated responses to presented clinical cases, as well as their overall attitudes toward AI's role in clinical settings.

**Method:** To achieve these objectives, we designed five clinical cases featuring patients with various conditions and prescribed medications. Each case included two general questions and six to ten specific questions. General questions assessed whether LLM could independently recognize drug-related issues and suggest relevant actions without prompting, while specific questions targeted particular therapeutic areas. Given its capabilities, ChatGPT was selected as the LLM tool for this study. ChatGPT was presented with each case in Slovenian language and associated questions, and clinical pharmacists evaluated its responses using a Likert scale (1 to 5) across five criteria: accuracy, clarity, comprehensiveness, linguistic quality, and reasoning. Each case was reviewed by two clinical pharmacists to ensure reliability. To further explore pharmacists' perspectives, five additional questions assessed their attitudes toward AI in clinical practice.

**Findings:** The results indicate that ChatGPT's accuracy was similar across general and specific questions, with an average rating of 3.40 for general questions and 3.17 for specific ones. ChatGPT demonstrated solid knowledge of active ingredients, such as indications, dosages, and adverse effects, but struggled with

identifying certain generic medications. The model was useful for initial identification of drug-related issues, often providing general health maintenance advice and frequently recommending consultation with a healthcare professional. The responses received average scores of 3.83 for clarity, 2.36 for comprehensiveness, 3.61 for linguistic quality, and 2.47 for reasoning. The results showed no significant differences in accuracy ratings between pharmacists who supported and those who questioned AI's role in solving clinical cases.

**Conclusion:** These findings underscore the importance of a critical approach when interpreting AI-generated responses, as ChatGPT—despite its strengths—can exhibit occasional inaccuracies. Achieving accurate outcomes in clinical contexts requires AI responses to be validated by additional sources and expert review.

<https://doi.org/10.1016/j.sapharm.2025.02.013>

### Methodological approach of a multi-method study to allow the development and implementation of a clinical pharmaceutical competency framework for hospital pharmacists in Austria

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**Background:** Competency frameworks (CFs) from hospital pharmacists are successfully implemented in many countries around the world (e.g. Australia, UK etc.). The successful development and implementation of such a bespoke framework however, continues to pose a considerable challenge.

**Purpose:** This study aimed to justify the chosen methods needed to develop and implement a bespoke national competency framework.

**Method:** An adopt and adapt approach is often used in the development of CFs. To this end a systematic review (SR) was carried out as a first step in this multi-method approach to comprehensively collate all published CFs. The protocol was registered with PROSPERO and the documents' quality assessed to allow a robust selection of included CFs. The most applicable competency framework to adapt to the Austrian context was identified to be the Common Training Framework (CTF) for hospital pharmacy practice across Europe. After extracting behavioral competencies from all additionally identified documents, discursive analysis within the team (BBM/JTS/AEW) assessed contextual national appropriateness and allowed mapping of the selected behavioral competencies to the CTF. This resulted in a preliminary national competency framework. Validation was carried out by an expert panel consisting of the board members of the Austrian Association of Hospital Pharmacists (AAHP). This resulted in the final version of the competency framework. The final step in this multi-method study was an analysis of possible barriers and facilitators for its implementation into practice. A phenomenological approach was chosen using face-to-face interviews with key healthcare (policy) stakeholders across Austria. The interview study used the domains of the Consolidated Framework for Implementation Research (CFIR) to underpin interview guide development and framework analysis.

**Findings:** The development of the bespoke competency framework and the related identified barriers and facilitators helped to inform a law change for hospital pharmacists in Austria which enables hospital pharmacists to work under the delegation of a medical prescriber. This represents the first significant role extension for hospital pharmacists since 1984.

**Conclusion:** This multi-method approach could serve as a supporting guideline for other countries that might struggle when trying to develop and implement a bespoke competency framework for hospital pharmacy practice.

<https://doi.org/10.1016/j.sapharm.2025.02.014>

### A comparison of Gen AI vs focus group discussion: Findings on workflow and design recommendation to develop a deprescribing application to assist medication review.

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**Background:** Optimising drug therapy for older adults in nursing homes is challenging due to polypharmacy, leading to poor compliance and adverse drug events from potentially inappropriate medications. A deprescribing application can improve medication review and existing workflow in nursing homes. However, to develop a usable deprescribing application, it is important to know the design and workflow recommendations from the key stakeholders first. Recently, there have also been questions about whether Generative Artificial Intelligence (Gen AI) can replace human research participants, to generate data that could save time and effort. We decided to do a comparison study with Gen AI in our Focus Group Discussion (FGD), as the pool of key decision-makers in nursing homes is inherently small.

#### Purpose

1) To conduct a FGD with key decision-makers in nursing homes to assess operation flow considerations and design recommendations for developing and implementing a mobile deprescribing application.

2) To further compare Gen AI output with thematic findings from the FGD.

**Method:** The FGD participants include key stakeholders (director, manager, administrator) involved in the management of nursing homes. The questions were validated, and informed consent was sought. Verbatim transcription was conducted from the audio recording. Subsequently, similar prompts were posted to ChatGPT 3.5 (a text-to-text model) and 4.0 (a data-to-text model). Data were analysed using qualitative content analysis. Data was coded and themes were generated for comparison. Inter-rater reliability was analysed from subthemes with SPSS 27 and NVivo 1.7.1.

**Findings:** The FGD was conducted with six participants lasting an hour. In-depth discussion was conducted, and four main themes were generated: "Reliability and adaptability to existing infrastructure"; "Medication management and communication"; "User competency, maintenance and legal considerations"; "Design considerations with regards to existing practices". Similar themes were generated from ChatGPT 3.5 and 4.0. When comparing with FGD, responses from both ChatGPT 3.5 and 4.0 were broader in coverage. However, they lacked depth to prompts and were repetitive. Our study suggested that it is not recommended to be used alone to replace human participants (Cohen's Kappa,  $\kappa = -0.154$ ).

**Conclusion:** In our FGD, we discovered that operational workflow requirements and design standardisation are important considerations for developing a usable and sustainable application for deprescribing. In addition, ChatGPT cannot fully replace human participants in our FGD study, but data could be used as a supplement. More research is needed to explore the potential of Gen AI as it continues to evolve.

<https://doi.org/10.1016/j.sapharm.2025.02.015>

### Implementation of pharmaceutical care services in Bulgaria –a case with rheumatoid arthritis

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**Background:** Rheumatoid arthritis (RA) is a chronic inflammatory joint disease that causes persistent pain, swelling, and destruction of joint structures. The development and implementation of pharmaceutical services for these patients have been neglected in many countries, despite the pharmacist's potential as the